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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent application of: Pintz et al.
Patent: 6,871,008 B1

Attorney Docket No.: GENSP046

Issued: March 22, 2005

Title: SUBPICTURE DECODING
ARCHITECTURE AND METHOD

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as first-class mail on June 23, 2005 in an envelope addressed to the Commissioner for Patents, P.O. Box 1450 Alexandria, VA 22313-1450.

Signed:

Audelia M. Sanchez

REQUEST FOR CERTIFICATE OF CORRECTION
OF OFFICE MISTAKE
(35 U.S.C. §254, 37 CFR §1.322)

Commissioner for Patents
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Certificate
JUN 30 2005
of Correction

Dear Sir:

Attached is Form PTO-1050 (Certificate of Correction) at least one copy of which is suitable for printing. The errors together with the exact page and line number where the errors are shown correctly in the application file are as follows:

SPECIFICATIONS:

1. Column 3, line 37, change "PX_CTL" to --PX_CTLI--. This appears correctly in the patent application as filed on January 3, 2000, on page 4, line 26.
2. Column 6, line 7, change "fist data" to --first data--. This appears correctly in the patent application as filed on January 3, 2000, on page 8, line 5.

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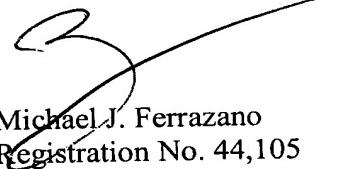
CLAIMS:

1. In line 1 of claim 2 (column 14, line 45) change “a recited” to --as recited--. This appears correctly in Amendment C as filed on June 30, 2004, on page 2, paragraph 2, line 1, as claim 35.
2. In line 1 of claim 5 (column 15, line 1) change “time manger” to --time manager--. This appears correctly in Amendment C as filed on June 30, 2004, on page 3, paragraph 3, line 1, as claim 38.
3. In line 3 of claim 10 (column 15, line 21) change “data” to --data stream--. This appears correctly in Amendment C as filed on June 30, 2004, on page 4, paragraph 2, line 2, as claim 43.
4. In line 3 of claim 12 (column 15, line 53) change “start time” to --starting time--. This appears correctly in Amendment C as filed on June 30, 2004, on page 5, paragraph 1, line 2, as claim 45.
5. In line 1 of claim 14 (column 15, line 61) change “th time” to --the time--. This appears correctly in Amendment C as filed on June 30, 2004, on page 5, paragraph 3, line 1, as claim 47.
6. In line 1 of claim 18 (column 16, line 9) delete second instance of “in”. This appears correctly in Amendment C as filed on June 30, 2004, on page 6, paragraph 1, line 1, as claim 51.
7. In line 3 of claim 22 (column 16, line 58) change “transforming” to --transferring--. This appears correctly in Amendment C as filed on June 30, 2004 on page 7, paragraph 2, line 2, as claim 55.

Patentee hereby requests expedited issuance of the Certificate of Correction because the error lies with the Office and because the error is clearly disclosed in the records of the Office. As required for expedited issuance, enclosed is documentation that unequivocally supports the patentee's assertion without needing reference to the patent file wrapper.

It is noted that the above-identified errors were printing errors that apparently occurred during the printing process. Accordingly, it is believed that no fees are due in connection with the filing of this Request for Certificate of Correction. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 500388 (Order No. GENSP046).

Respectfully submitted,
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Fig. 3 is a block diagram illustrating the components of a subpicture data stream;

Fig. 4 is a block diagram illustrating one embodiment of a system for decoding and processing a subpicture data steam;

5 Fig. 5 is a block diagram illustrating a display unit in accordance with one embodiment of the present invention;

Fig. 6 is a block diagram of a subpicture hardware unit in accordance with one embodiment of the present invention;

10 Fig. 7a is the first half of a string of code for one particular example of a subpicture data stream;

Fig. 7b is the second half of a string of code for one particular example of a subpicture data stream;

Fig. 8 is a block diagram illustrating the bit layout of a set color (SET_COLOR) command;

15 Fig. 9 is a block diagram illustrating the bit layout of a set contrast (SET_CONTR) command;

Fig. 10 is a block diagram illustrating the bit layout of a set display area (SET_DAREA) command;

20 Fig. 11 is a block diagram illustrating the bit layout of a set start address of pixel data (SET_DSPXA) command;

Fig. 12 is a block diagram illustrating the bit layout of a change color/contrast (CHG_COLCON) command;

Fig. 13 is a block diagram illustrating the bit layout of line control information (LN_CTLI) of a CHG_COLCON command; and

25 Fig. 14 is a block diagram illustrating the bit layout of pixel control information (PX_CTLI) of a CHG_COLCON command.

DESCRIPTION OF THE SPECIFIC EMBODIMENTS

The present invention relates generally to methods and apparatus for processing subpicture data of a DVD-video stream, and more particularly, to a novel 30 subpicture processing system which divides subpicture processing functionality between software and a subpicture processing hardware unit.

In accordance with the present invention, it is preferable for a subpicture hardware unit to process subpicture display control commands that should be performed

Second processing unit 54 receives the SP_PCKs 18 and assembles them so that an entire subpicture unit data stream (SPU) 10 is present. Then second processing unit 54 defines data structures in system memory 56 to store subpicture pixel data (PXD) 14 and subpicture control command data (SP_DCSQT) 16. Preferably, second processing unit 54 defines a first data structure 64 to hold PXD 14, and a second data structure 66 to hold SP_DCSQT 16. In addition, other data structures or registers may be present in system memory 56 to hold a PXD pointer (PTR), a pointer time stamp (PTS), which indicates when the PXD data pointed to by pointer PTR will be needed by the display unit, and video object unit (VOBU) information. As one skilled in the art will appreciate, VOBU information includes information, such as presentation starting time, presentation termination time, and the presentation period for a video object unit. In the illustrated embodiment, the PTR is stored in data structure or register 68, the PTS is stored in data structure or register 70, and the VOBU information is stored in data structure or register 72. By using these data structures, second processing unit 54 can decode the SP_PCK 18 well prior to when the pixel data and control data is needed, and then store the data in memory until it is used. When it is time to present the data for display, a time manager module in second processing unit 54 transfers PXD data 14 and commands from SP_DCSQT data 16 into fast local memory 58, which may reside in or in close proximity to second processing unit 54. That is, fast local memory 58 may be the cache memory in second processing unit 54, or some other suitable high speed memory in system 50. From fast local memory 58, a DMA mechanism presents the SPU data (PXD and SP_DCCMD commands) to the input FIFO's of subpicture hardware unit 62. The configuration and operation of subpicture hardware unit 62 will be described in greater detail below with reference to Fig. 6.

25 After subpicture hardware unit 62 processes the subpicture data and commands to generate a subpicture graphical data stream, display unit 60 combines the subpicture graphical data stream with a main picture data steam and an overlay display data stream. As illustrated in Fig. 5, display unit 60 preferably comprises a first combiner circuit 80 for combining data from a main picture processing unit 76 with data from
30 subpicture hardware unit 62. A second processing unit 82 receives the output from first combiner circuit 80 and combines it with data from an OSD processing unit 78. At this point, main picture data, OSD data and subpicture data all are combined together into a single signal 74 and output to an A/D converter and then to a display device, such as a TV or computer monitor.

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-33 (Canceled)

34. A subpicture decode and execution system, comprising:

a first processor arranged to parse a received video data stream into a number of separate packs some of which are subpicture video packs; and

a second processor coupled to the first processor arranged to receive the subpicture video packs from the first processor, wherein the second processor processes a received subpicture video pack to provide a subpicture pixel data (PXD), a subpicture control command data (SP DCSQT), a pixel data pointer (PTR) that points to an associated subpicture pixel data (PXD) and a corresponding pointer time stamp (PTS) that indicates a time that a particular subpixel data (PXD) pointed to by a corresponding pointer PTR will be needed for further processing and video object unit (VOBU) information.

35. A system as recited in claim 34, further comprising:

a system memory unit coupled to the second processor wherein for a particular PXD and SP DCSQT, comprising:

a PXD data structure for storing the PXD;

a SP DCSQT data structure for storing the SP DCSQT;

a PTR data structure for storing the PTR corresponding to the stored PXD wherein the stored PTR points to the stored PXD;

a PTS data structure for storing the PTS corresponding to the stored PTR; and

a VOBU data structure for storing the VOBU.

36. A system as recited in claim 34, wherein VOBU information includes information, for a video object unit that includes presentation starting time, presentation termination time, and presentation period.

37. A system as recited in claim 34, further comprising:

a fast local memory coupled to the system memory; and
a time manager module arranged to transfer PXD from the PXD data structure and an associated SP DCSQT from the SP DCSQT data structure into the fast local memory when needed for the further processing.

38. A system as recited in claim 37, wherein the time manager module is incorporated into the second processor and wherein the fast local memory is in close proximity to the second processor.

39. A system as recited in claim 34, further comprising:

a display unit coupled to the system for displaying the further processed subpicture pixel data.

40. A system as recited in claim 39, further comprising:

a dedicated hardware subpicture unit coupled to the display unit, the local memory, and the second processor for performing the further processing.

41. A system as recited in claim 34, wherein the system is incorporated into a DVD player or a set top box or an LCD TV.

42. A system as recited in claim 34 wherein the subpicture control command data includes pixel color information, pixel contrast information, or subpicture display area information.
43. A method of decoding subpicture video packs, comprising:
parsing a received video data stream into a number of separate packs by a first processor;
determining a pack type;
when some of the packs are subpicture video packs, forwarding the subpicture video packs to a second processor; and
providing a subpicture pixel data (PXD), a subpicture control command data (SP DCSQT), a pixel data pointer (PTR) that points to an associated subpicture pixel data (PXD) and a corresponding pointer time stamp (PTS) that indicates a time that a particular subpixel data (PXD) pointed to by a corresponding pointer PTR will be needed for further processing and video object unit (VOBU) information by the second processor.
44. A method as recited in claim 43, further comprising:
coupling a memory unit to the second processor wherein for a particular PXD and SP DCSQT, further comprising:
storing the PXD in a PXD data structure;
storing the SP DCSQT in a SP DCSQT data structure;
storing the PTR corresponding to the stored PXD in a PTR data structure wherein the stored PTR points to the stored PXD;
storing the PTS corresponding to the stored PTR in a PTS data structure; and
storing the VOBU in a VOBU data structure.

45. A method as recited in claim 44, wherein VOBU information includes information, for a video object unit that includes presentation starting time, presentation termination time, and presentation period.

46. A method as recited in claim 44, further comprising:

when needed for the further processing , transferring PXD from the PXD data structure and an associated SP DCSQT from the SP DCSQT data structure into a fast local memory that is coupled to the system memory by a time manager module.

47. A method as recited in claim 46, wherein the time manager module is incorporated into the second processor and wherein the fast local memory is in close proximity to the second processor.

48. A method as recited in claim 43, further comprising:

displaying the further processed subpicture pixel data by a display unit coupled to the system.

49. A method as recited in claim 48, further comprising:

performing the further processing by a dedicated hardware subpicture unit coupled to the display unit, the local memory, and the second processor.

50. A method as recited in claim 43, wherein the method is performed by a DVD player or a set top box or an LCD TV or a computer monitor.

51. A method as recited in claim 43 wherein the subpicture control command data includes pixel color information, pixel contrast information, or subpicture display area information.
52. Computer program product for decoding subpicture video packs, comprising:
computer code for parsing a received video data stream into a number of separate packs by a first processor;
computer code for determining a pack type;
computer code for forwarding the subpicture video packs to a second processor when some of the packs are subpicture video packs;
computer code for providing a subpicture pixel data (PXD), a subpicture control command data (SP DCSQT), a pixel data pointer (PTR) that points to an associated subpicture pixel data (PXD) and a corresponding pointer time stamp (PTS) that indicates a time that a particular subpixel data (PXD) pointed to by a corresponding pointer PTR will be needed for further processing and video object unit (VOBU) information by the second processor; and
computer readable medium for storing the computer code.
53. Computer program product as recited in claim 52, further comprising:
computer code for coupling a memory unit to the second processor wherein for a particular PXD and SP DCSQT, further comprising:
computer code for storing the PXD in a PXD data structure;
computer code for storing the SP DCSQT in a SP DCSQT data structure;
computer code for storing the PTR corresponding to the stored PXD in a PTR data structure wherein the stored PTR points to the stored PXD;
computer code for storing the PTS corresponding to the stored PTR in a PTS data structure; and

computer code for storing the VOBU in a VOBU data structure.

54. Computer program product as recited in claim 53, wherein VOBU information includes information, for a video object unit that includes presentation starting time, presentation termination time, and presentation period.

55. Computer program product as recited in claim 53, further comprising:

when needed for the further processing , transferring PXD from the PXD data structure and an associated SP DCSQT from the SP DCSQT data structure into a fast local memory that is coupled to the system memory by a time manager module.

56. Computer program product as recited in claim 55, wherein the time manager module is incorporated into the second processor and wherein the fast local memory is in close proximity to the second processor.

57. Computer program product as recited in claim 52, further comprising:

displaying the further processed subpicture pixel data by a display unit coupled to the system.

58. Computer program product as recited in claim 57, further comprising:

performing the further processing by a dedicated hardware subpicture unit coupled to the display unit, the local memory, and the second processor.

59. Computer program product as recited in claim 52, wherein the method is performed by a DVD player or a set top box or an LCD TV or a computer monitor.

(Also Form PT-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

PATENT NO. : 6,871,008 B1

DATED : March 22, 2005

INVENTOR(S) : Pintz et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Specifications:

Column 3, line 37, change "PX_CTL" to --PX_CTLI--.

Column 6, line 7, change "fist data" to --first data--.

In the Claims:

In line 1 of claim 2 (column 14, line 45) change "a recited" to --as recited--.

In line 1 of claim 5 (column 15, line 1) change "time manger" to --time manager--.

In line 3 of claim 10 (column 15, line 21) change "data" to --data stream--.

In line 3 of claim 12 (column 15, line 53) change "start time" to --starting time--.

In line 1 of claim 14 (column 15, line 61) change "th time" to --the time--.

In line 1 of claim 18 (column 16, line 9) delete second instance of "in".

In line 3 of claim 22 (column 16, line 58) change "transforming" to --transferring--.

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JUL - 6 2005